Risk Assessment and Management

Risk Assessment

Step 1

- **Is a new health problem present?**
- **What are the symptoms?**
- **What do the affected individuals have in common?**

Step 2

- **What is causing the problem?**
- **What is the source of the problem?**

Step 3

- **What are the sources of exposure to the chemical?**
- **How much exposure are people in the area receiving?**
- **Is the exposure acute or chronic? (Is it likely to happen only once or often over the course of time?)**

Conclusion:

How great is the risk to people?

Risk Management

- **How do the people involved perceive the risk? Are their perceptions accurate?**
- **Who is responsible for the harmful substance and its presence in the environment? What role does the responsible party have in any cleanup?**
- **What are the benefits and tradeoffs that a person must weigh when making a decision about the risk?**

Conclusion:

What action should people take to minimize their risk? Can the risk be managed by individuals, the community, and/or governments?

Minamata Disease

Part I

In the city of Minamata, along the western coast of Japan, unusual things began to happen in the 1950s. First, dead fish began to float in the bay. Then, cats began to fall into the sea and die in what people in the town called "cat suicide." At the same time, birds began to drop dead from the sky.

Soon, people began to act strangely, too. They stumbled while walking, were unable to write, and had trouble buttoning their buttons. In only a few years, the illness seemed to be an epidemic. Fishermen seemed the most severely afflicted. Men who were once strong suddenly had trouble keeping their balance. They could not stay afloat if they fell into the sea from their fishing boats. They had convulsions and had to be tied to their beds, where many of them died. Sadly, other members of their families also had the strange disease, which came to be known as Minamata disease.

Doctors believed that the mysterious symptoms were caused by poisoning. They tried to find a food source that birds, cats, fish, and people had in common. Finally, they realized that it was the fish that were contaminated, and the birds, cats, and people were eating the fish. What was contaminating the fish?

Part II

Although Minamata used to be a poor fishing village, it prospered when the Chisso Corporation built a manufacturing plant in the city. For 20 years, the plant had been making a chemical called acetaldehyde (a-seh-TAL-deh-hide), which is used to make plastics, drugs, and perfume. As part of its normal operations, the Chisso Corporation dumped waste products into Minamata Bay. Fishermen complained that the dumping was killing the fish. The company paid the fishermen money to help them since there were fewer fish to catch and sell. This arrangement seemed to work well for everyone until people started getting sick.

Mercury is one ingredient that is used to manufacture acetaldehyde. When mercury is dumped into water, the bacteria in the water convert it into organic mercury. When the bacteria are eaten by small fish, which are in turn eaten by larger fish, the mercury becomes concentrated in the tissue of the fish. What made this contamination of the fish so dangerous to humans?

Part III

Mercury is a strong toxin that causes damage to the brain. Most people are exposed to mercury by eating contaminated fish. The U.S. Environmental Protection Agency has estimated that people who eat more than 30 pounds of fish in a year are at higher risk of experiencing toxic effects from mercury. In Minamata, fishermen and their families often ate contaminated fish for every meal. It was this exposure to small amounts of mercury over long periods of time that caused the Minamata disease. In all, more than 12,000 people have suffered from the disease.

Part IV

Many people, devastated by the disease, moved away from Minamata to make their living elsewhere: The city now has only 70 percent of the number of people it once had. The Chisso Corporation no longer uses mercury in its manufacturing or dumps waste into the bay. It has paid more than $2 billion to victims of Minamata disease. The bay was dredged, and 1.5 million cubic meters of contaminated sludge was removed from it. Finally, 40 years later, the water in the bay is safe for swimming and fishing.